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Changing Perspectives In Professional Development

This article explores three major shifts in beliefs about professional development that are suggested by the research on teacher learning and shares examples of programs from the National Eisenhower Consortia that demonstrate the importance of the shifts.

Introduction

Over the past two decades teacher professional development has undergone profound changes from a focus on mostly "one size fits all" workshops to more ongoing, subject and need-focused programs, often embedded in the school day, where many belong (Loucks-Horsley, Love, Stiles, Mundry & Hewson, 2003). When my colleagues and I began our work studying professional development in science, the *Benchmarks for Science Literacy* (AAAS, 1993) and the *National Science Education Standards* (NRC, 1996) had not yet emerged on the education scene. Now, it is hard to imagine a time when educators weren't focused on standards-based education.

Half-way through this first decade of the 21st century, educators are working diligently to ensure that all students learn and schools demonstrate annual yearly progress. Schools are scrambling to find ways to reach students who are struggling. Once again professional development is being seen as a major tool to support improved practice and to assist teachers in meeting goals for student learning. Recently our perspectives about what works in professional development and where to best focus energy and resources have been shifting based on research and lessons from the field. This article explores three major shifts in beliefs about professional development that are suggested by the research on teacher learning and shares examples of programs from the National Eisenhower Consortia that demonstrate the importance of the shifts.

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When it Comes to Student Learning, Teaching Matters—a Great Deal

There is a growing recognition of the value of a teacher's experience and knowledge with regard to their promoting student learning. Experienced teachers who use effective instructional strategies tend to produce higher student achievement outcomes (Rowan, Correnti & Miller, 2002). Most interesting is research that suggests teachers can make the difference for all students, even those students who come from disadvantaged backgrounds (Wenglinsky, 2002). This research supports the ideas generated in the 1980s that "effective schools" could create conditions for learning for all students and counters research from the 1960s that found that schooling could not overcome the effects of students' backgrounds (Coleman et al., 1966).

Schooling can make a difference for all students if they have access to quality teaching and are held to high expectations. Unfortunately, this is not always the case. Research by Sanders and Rivers (1996) found that children who were taught by several ineffective teachers in a row were highly disadvantaged and performed lower than similar students taught by several more effective teachers in a row. As we make the shift in the field to seeing that teaching makes the difference in student learning, schools and school districts are recognizing the obligation of ensuring that students get access to the best possible teaching. This requires rethinking how schools support teachers to develop and deepen

teaching expertise throughout their careers.

New teachers need content-focused mentoring that supports them to teach their specific curriculum and content and inducts them into the profession of teaching.

Effective teaching is complex and involves drawing from a deep knowledge base in the content as well as in instructional strategies for teaching content. Stigler and Hiebert (2004) calls for building a knowledge base for the teaching profession—"teachers need theories, empirical research, and alternative images of what implementation looks like"(p. 16).

Understanding the subject matter is essential for effective teaching. Research studies that examined the relationship between teacher qualifications and background and student achievement in mathematics and science found that high school math and science teachers with a standard certification in their field of instruction (usually indicating coursework in both subject matter and education methods) had higher achieving students than teachers teaching without certification in their subject area (Goldhaber & Brewer, 2000; Darling-Hammond, 2000; Monk, 1994).

For beginning teachers, there is a growing recognition of the need for a different kind of induction program that goes beyond tips for classroom management, directions to the supply closet, and general teaching strategies. New teachers need content-focused mentoring that supports them to teach their specific curriculum and content and inducts them into the profession of teaching. The content-focused mentoring model assigns beginning teachers or teachers who wish to improve their teaching to an accomplished teacher mentor who teaches the same subject matter. The focus of the work between the mentor and mentee is on teaching the content and ensuring student understanding of important scientific or mathematical ideas. The mentor and mentee work on lessons together, observe one another teach and study the local, state and national standards in their subject area. Together, they get to know the research on how children learn the content and the alternative conceptions students bring to their learning. For example, the Northern New England Co-Mentoring Network Project (www.nnecn.org), supported by a National Science Foundation grant awarded to the Maine Mathematics and Science Alliance, developed a model for content-focused mentoring and teacher leadership to support beginning teachers in Maine, New Hampshire, and Vermont. Novice teachers or teachers new to teaching science or mathematics are paired with accomplished veteran teachers who provide coaching and mentoring on standards and research-based teaching of the content. When novice teachers encounter material they find difficult to teach or hard for students to learn, the mentor teacher helps them examine the research on learning science and mathematics and deepen their understanding of the ideas students find confusing and reflect on how to adjust their instructional strategies based on the research (Keeley, 2005). By focusing on quality teaching of the content, informed by standards and research, this program is building the next generation of effective science and mathematics teachers.

Since teaching matters so much to student learning, veteran teachers, too, must continue to deepen their knowledge and skills throughout their careers. They need opportunities to collaborate with others, reflect on practice, learn from data and results and see what does and does not work in their classrooms, recognizing that strategies that work one year with one class, may need to be adjusted for new students. Especially in the science field where there are discoveries and new developments, teachers need to continue to expand their content knowledge through courses, reading and other professional development.

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Professional developers at the Northwest Regional Education Laboratory (NWREL) facilitate the use of lesson study with teachers in Oregon and Washington to build communities of practice characterized

by teachers working together on lesson designs, talking with one another about student learning and observing teaching in the classroom. According to Eric Blackford, Unit Director for the Mathematics and Science Education Center in the Center for Classroom Teaching and Learning, lesson study is a way to shift teacher learning from one time "outside learning" to learning as part of teachers' "ongoing professional life." NWREL works with partner school sites that involve the faculty and administration in examining lessons to enhance teaching. The approach involves participating faculty in examining their practice on an ongoing basis. At one of the partner site schools, the principal and assistant principal actively engage in learning with the teachers to enhance the teaching of subject matter.

As teachers develop their teaching expertise, professional development can shift to activities that support them to assume roles as instructional leaders, supporting others in their buildings to use quality teaching methods. Schools, like other organizations, need leadership at all levels embedded in the school as a whole (Lambert, 1998; Fullan, 2001). This becomes critically important when the school is trying to make changes in its practices because leaders are needed to support the changes and model effective practice. As Lambert writes, "Without broad based leadership the ability of a school to grow and become better for children is limited." (p. 93). Blackford points out that using strategies such as lesson study "deepens teachers' content knowledge and prepares them to work in a professional community focused on ensuring quality teaching."

Professional Development Needs to be About the Content and How to Teach it

This idea may seem obvious, yet there are still too many professional development resources used for programs that have little to do with learning to teach the subject matter. Some focus only on learning content, others only on teaching techniques and still others on extra curricula topics.

What we have discovered from research is the importance of professional development that is focused squarely on increasing teachers' content and pedagogical content knowledge and teaching skills. Greater positive effects on student learning are seen from inservice programs that focus on content knowledge and on how students learn subject matter (Kennedy, 1999; Weiss, Pasley, Smith, Banilower & Heck, 2003). Teachers apply their professional development learning more often when the professional development programs they attend have direct links to the teachers' curriculum, they are afforded time to try out new ideas and practices with colleagues, and there is ongoing support (Loucks-Horsley et al. 2003). Professional developers are seeing a much higher pay off in the classroom when teacher learning is based on what the teachers teach and teachers are part of a professional learning community that focuses on teaching practice and the ultimate goal of enhanced student learning (Sparks, 2002).

Research evidence suggests that professional development that is most closely linked to improved student learning deepens teachers understanding of the content and how to teach it (Cohen & Hill, 2000; Wiley and Yoon, 1995; Brown, Smith and Stein, 1996; and Kennedy, 1999). Mary Kennedy (1999) examined studies of professional development in mathematics and science that included evidence of student learning. She concluded that "the content of in-service programs does indeed make a difference and that programs that focus on subject-matter knowledge and on student learning of particular subject matter are likely to have larger positive effects on student learning than are programs that focus mainly on teaching behaviors" (p. 25). The programs she examined with the greatest effects were not focused purely on teaching the subject matter, but also on teaching the subject matter in the context of how students learn it. Further evidence comes from the *Inside the Classroom* study (Weiss et al., 2003) that found that it is necessary, but not sufficient, for teachers to have content knowledge. This study reports that: "[Teachers] also must be skilled in helping students develop an understanding of the content, meaning that they need to know how students typically think about particular concepts, how to determine what a particular student or group of students thinks

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about those ideas, and how to help students deepen their understanding" (p. 28).

Knowledge of content also helps teachers to develop an essential ingredient for effective teaching, their specialized professional knowledge, called pedagogical content knowledge. Pedagogical content knowledge is an understanding of what makes the learning of specific topics easy or difficult for learners and knowledge of ways of representing and formulating subject matter to make it comprehensible to different learners (Shulman, 1986; Cochran, DeRuiter, & King, 1993; Fern ndez-Balboa & Stiehl, 1995; Grossman, 1990; van Driel, Verloop, & De Vos, 1998). Studies suggest that teachers' development of pedagogical content knowledge is contingent on having subject matter knowledge (Clermont, Krajcik, & Borko, 1993). With limited content understanding, teachers' ability to develop their understanding of how to teach the content is restricted. The National Science Education Standards (National Research Council, 1996) suggest that pedagogical content knowledge is an essential part of effective teaching.

> "Effective teaching requires that teachers know what students of certain ages are likely to know, understand, and be able to do; what they will learn quickly; and what will be a struggle. Teachers of science need to anticipate typical misunderstandings and to judge the appropriateness of concepts for the developmental level of their students. In addition, teachers of science must develop understanding of how students with different learning styles, abilities, and interests learn science. Teachers use all of that knowledge to make effective decisions about learning objectives, teaching strategies, assessment tasks, and curriculum materials" (NRC, 1996, p. 62).

The Department of Education at Rhode Island College in collaboration with the East Bay Educational Collaborative, the Eisenhower Regional Alliance at TERC and participating school districts joined forces to develop a model for increasing teachers' content and pedagogical content knowledge. They combined the use of lesson study—a process by which groups of teachers meet regularly over long periods of time (several months to a year) to work on the design, implementation, testing, and improvement of one or several lessons—with a content-based institute. Teacher and administrator teams work together in a science inquiry experience to deepen understanding of science topics. They use their experience to inform their lesson study and incorporate the use of science notebooks to reinforce the inquiry process and enhance student literacy. The integration of the content institute with the ongoing lesson study process leads the teacher and administrator teams to learn the content and focus on how to best teach it to meet student learning goals. In a recent interview, Joyce Tugel, professional developer for science at the Regional Alliance at TERC stated that through this design "the teams develop a common understanding of what inquiry science is, what it looks like in the classroom and how to do it." She says the program is designed to be "relevant and grounded in the teachers' own practice rather than an isolated professional development strategy."

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In another example, the Far West Eisenhower Regional Consortium for Science and Mathematics supports the use of cases of science learning to integrate content and pedagogical content learning for teachers. Teachers who collaborated in examining practice through case discussions of content learning in science showed gains in students' science test scores whereas there were no gains among comparable students of non-participating teachers (Daehler & Shinohara, 2001). Case discussions and examination of student work have been shown to develop teachers' content knowledge and pedagogical reasoning skills and to increase student achievement (Barnett & Tyson, 1993).

In a recent interview, Mayumi Shinohara, one of the authors of the science cases stated that:

> "Teachers engage in doing the science in the cases and as they do they are thinking really hard about the learning of that science … they see there is real logic behind the common wrong ideas kids have and see the diversity of ideas kids have about

science concepts. It leads the teachers to very different ways of thinking about students' ideas and how they would work with the kids to help them understand the concepts." She went on to say that "the value of professional development focused on content and pedagogical content knowledge is that it allows for going deeper to better understand student learning and student thinking. While knowing the curriculum materials and how to use the science kits is important, we must create opportunities for professional development to focus on the harder things teacher must do—such as developing the habits of mind to be always wondering how children will respond to the lesson. Professional development that only deals with the basics leaves teachers with the hardest work to tackle later on their own."

The Purpose of Professional Development is to Enhance Learning of Challenging Content for All Students

Another significant positive change we are witnessing in the field is the shift to seeing and believing that the purpose of professional development is to enhance learning of challenging content for all students. This has led to increased accountability and responsibility for professional development programs to better equip teachers to teach a rigorous curriculum to all students and to ensure that students have every opportunity to meet the highest standards. Educators are now recognizing professional development as a tool focused on building the knowledge and skills of teachers to enhance student outcomes.

Teachers can examine student work and other artifacts to see changes in the type of work and thinking students are doing, as well as their level of understanding.

The research demonstrates that students of all races, cultures, and genders are capable of learning science. "All learners from very young ages come to school with conceptions about the world, are curious about phenomena, and can inquire into them and make meaning of them. When all children have access to quality teaching and high expectations, they are able to meet standards for content learning" (Campbell, 1995). Through its use of lesson study mentioned earlier, the Northwest Regional Education Laboratory is increasing teachers' use of inquiry in the classroom and enhancing knowledge of how children learn science. Teachers engage in lesson study to redesign their science instruction to increase the use of inquiry-based learning. One district using a kit-based science curriculum worked together to revise the lessons so that they were more inquiry focused and met specific state standards and learning expectations for grade levels. This professional development program plays a key role in helping teachers develop a wide variety of teaching strategies to meet the needs of all learners.

There are significant differences in the professional development schools choose to implement when they see its purpose to be the enhancement of student learning. They think about what kind of professional development program they need based on student learning needs. They dig into data to find out where their students are not meeting proficiency goals and develop professional development plans related to enhancing teaching and learning in those areas and on building stronger school communities to support that learning. Later, classroom observations and teacher surveys can provide data on whether and how teachers are using new practices.

Teachers can examine student work and other artifacts to see changes in the type of work and thinking students are doing, as well as their level of understanding. With evidence of change in teacher practice and student learning outcomes, the school can begin to build a case for the effectiveness of its professional development program.

Looking Ahead

While the standards have raised the quality of teaching in many places, a study investigating over 350 science and mathematics lessons found that "fewer than one in five lessons were intellectually rigorous—schools in rural settings and those with high percentage of minority students tended to be rated as lacking intellectual rigor" (Weiss et al., 2003). It seems our nation is still at risk when it comes to science learning. A May 2004 article in the *New York Times* warned that the U.S. has started to lose its worldwide dominance in science and innovation as evidenced by fewer patents being issued, fewer Nobel Prizes, and fewer scientific papers published by people from the United States. Recent international studies show that U.S. students still

lag behind their counterparts in other developed nations.

The implications are that educators need to continue efforts to build the capacity of teachers to provide a challenging science education that prepares all students for the world they live in. The three shifts discussed in this article must inform decision making about the structure, form and focus of teacher professional development. Policy makers and practitioners must recognize the importance of quality teaching to student learning and create permanent mechanisms and structures, embedded in the school culture, that support teachers to develop deep knowledge of teaching throughout their careers. This includes providing professional development with a strong content and pedagogical content focus tied to student learning goals and situated in teacher practice. Teachers are enriched by studying teaching, examining student learning, and using knowledge from research. Educators must abandon outmoded approaches to staff development and invest in these more "practice-based" approaches to professional learning for teachers.

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